"Deblistering Apparatus"

The present invention relates to deblistering apparatus and a deblistering process.

Pharmaceutical tablets and the like are frequently sold in 'blister packs'. Blister packs are designed to provide a number of tablets or the like together, and are generally formed by having a number of blisters, one for each tablet or the like, and some form of substantially flat 'lid'. Increasingly, the lid includes some form of metal 'foil', so as to (a) increase the child-resistance of such packs being openable, and (b) to provide a better seal over the blisters to prevent as far as possible contamination of the tablet and the atmosphere in the blisters prior to use.

For various reasons, such as for instance incorrect filling, wrong batch labelling or specific formulation requirements, it is desired to deblister the tablets from the pack, especially where the

tablets are valuable and can be reused. Deblistering of tablets from a 'push-through' blister pack is generally carried out by passing the packs through rollers. For the more sealed nature of child-resistant packs, deblistering of tablets from such packs requires cutting of the foil lid prior to pushing out the tablet from the blister.

The generality of this operation is shown in US4428709. However, the machinery shown in US4428709 only relates to individual cutting and punching along a strip of blister packages in ribbon form. Our WO 00/27709 describes a rotary deblistering apparatus, whereby blister packs in their more usual form can be automatically loaded onto a rotary drum, and the cutting and deblistering carried out at separate stations as the drum rotates to accommodate further blister packs in an automatic operation.

However, it is often desired to be able to extract the contents of a single blister pack. This does not require the more sophisticated machinery shown in WO 00/27709. Moreover, it is often desired to be able to use the same machinery to extract the tablets from different patterns, sizes and shapes of blister packs.

It is an object of the present invention to provide a simple but effective apparatus and process adapted to provide quick and efficient single blister pack extraction.

According to one aspect of the present invention, there is provided apparatus for deblistering a pharmaceutical blister pack having a number of product blisters and a lidding material thereover, the apparatus comprising a pack holding means adapted to hold the blister pack and means to transfer the pack into and out of alignment with an operating position, the operating position having a lidding material cutting means and a blister punching means on opposing sides thereof.

The lidding material is generally in the form of a foil, often including one or more layers of metallic material. The lidding material creates a 'lidded' or 'sealed' or 'closed' arrangement with the blisters.

The pack holding means is preferably adapted to match the configuration of the design of the pack to be deblistered. More preferably, the pack holding means has a series of complementary indentations or holes corresponding to the blisters of the pack to be deblistered. The holes could extend through the pack holding means to its other face.

The pack holding means preferably retains the blister pack either through position, friction or additional retaining or restraining means until the empty blister pack is ready to be discarded. Such retaining or restraining means includes any pneumatic or mechanical arrangement, such as an over plate.

In one embodiment of the present invention, the pack holding means is retained by a plate transfer means, which transfer means is adapted to provide the movement of the pack holding means into and out of alignment of the operating position. The transfer means could comprise any form of mechanical arrangement, preferably including means to confirm the alignment of the pack holding means into and out of the operating position. Such means includes guide rails and pins and the like, and the transfer means may be an arm or a piston or the like having reciprocal motion.

The pack holding means and any plate transfer means may be moveable in and out of alignment of the operating position in 1, 2 or 3 dimensions, for example linearly, arcuately, etc, either as one movement or single action, or in a number of discrete or articulated movements or actions.

The packing holdings means and/or the plate transfer means may also be formed of a number of connected parts, one or more of which may serve to help guide and/or hold such means during their movement.

In another embodiment of the present invention, the pack holding means is adapted to rotate when out of alignment with the operating position. Preferably, the rotation is provided by rotation of the transfer means along its axis of movement. Rotation of the pack transfer means allows its position to be

adapted to suit the user, and/or loading and/or unloading of the blister pack.

The lidding material cutting means generally comprises a number of cutting pieces such as studs having means to cut through lidding material at the operational end of each piece. The pieces may be attached to a general carrier plate so as to be simultaneously operable. The pieces are preferably arranged in a pattern which is complementary to the position of the blisters on the pack to be deblistered. Preferably, the cutting means is changeable. The cutting means may be changeable by the introduction of different patterned cutting plates the different blister arrangements, or by re-patterning of the pieces on a general carrier plate.

The cutting means is moveable between a rest position and a cutting position, which cutting position involves the engagement of the cutting means with the blister pack so as to wholly, substantially or partly weaken or break through the lidding material of the blister pack around each blister as is known in the art.

The blister punching means comprises any known means adapted to pressure the blisters of the blister pack so as to force the contents of the blisters through or past the lidding material. Generally, the contents of the blisters will be collectable. The punching means may comprise separate elements adapted to individually punch each blister, or a

more general punch adapted to act directly or indirectly on all blisters simultaneously. The latter arrangement has the advantage of not requiring changeability to act on different blister-patterned blister packs.

The punching means may act directly or indirectly on the blisters. The pack holding means may include means to engage the blisters, which engagement is controlled by the punching means.

In another embodiment of the present invention, the blister pack is wholly or substantially in a vertical position in the operating position, such that the contents of the blisters will fall away from the blister pack due to gravity once deblistered.

According to second aspect of the present invention, there is provided a method of deblistering a pharmaceutical blister pack having a number of product blisters covered by a lidding material, comprising the steps of:

locating the blister pack on a pack holding means having complementary pockets corresponding to the blisters of the blister pack,

transferring the pack holding means into an operating position in alignment with a lidding material cutting means and a blister punching means,

wholly, substantially or partly cutting the lidding material by activation of the cutting means,

deblistering the contents of the product blisters by engagement of the blister punching means such that the contents are without the blister pack, and

moving the deblistered blister pack out of alignment with the operating position.

An embodiment of the present invention will now be described by way of example only and with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a schematic perspective view of apparatus according to one embodiment of the present invention;

Figure 2 is a second schematic perspective view of the apparatus of Figure 1 with the pack holding means out of alignment with the operating position;

Figures 3a-3d are a series of schematic side views of the cutting and punching operations of the apparatus of Figure 1;

Figures 4a-4c are plan and two side view of the pack holding means shown in Figure 1; and

Figure 5 is a schematic perspective view of apparatus according to another embodiment of the present invention.

Referring to the drawings, Figure 1 shows very schematically the principle of the present invention.

The present invention provides a single cutting and punching station for a pharmaceutical blister pack. These operations can be carried out whilst the blister pack is stationary, and so in alignment with the means for cutting and punching. This provides simplicity of arrangement of the features of the invention, and the minimal number of moving parts to effect deblistering of the blister pack.

In Figure 1, there is schematically shown a lidding material cutting means 4 and a blister punching control means 6 on opposing sides of a transfer plate 2 having a pack holding means 10 therewith. The pack holding means 10 is in an operating position between the cutting means 4 and the punching means 6, and is moveable by a ram 8 out of this operating position alignment.

Figure 2 shows the pack holding means 10 out of alignment by movement of the ram 8 and transfer plate 2, and also rotation of the pack holding means 10 into a horizontal position as explained hereinafter.

Figures 4a-4c show a pack holding means 10 in detail. The pack holding means 10 is similar to that shown in our WO 00/27709, the features of which

are incorporated herein by way of reference. Generally, the pack holding means comprises a top plate 14 having a series of apertures 12 therein, the apertures 12 being patterned to be complementary to the shape of the blister pack to be deblistered. The apparatus of the present invention could be provided with different pack holding means for different patterned blister packs, or different top plates.

Across the top of the top plate 14 is a blister pack retainer frame 16 hinged along one side of the top plate 14. The frame 16 is rotatable away from the top plate 14 during loading or unloading of the blister pack with the pack loading means 10, and then rotatable down on top of the blister pack so as to securely and firmly retain the blister pack against the top plate 14 during use.
Attached to the top plate 14 via a shoulder bolt 18 is a bottom plate 20 biased away from the top plate 14 by two intermediate springs 22. Upstanding from the bottom plate 20 are a series of eject pins 24 aligned with the pockets 12. The pins 24 are fixed to the bottom plate 20 by holding screws 26.

Preferably, the pack holding means 10 is located within the transfer plate 2 attached to the arm 8 by press fitting or a simple catch mechanism, such that the pack holding means 10 can quickly and easily be changed for different patterned blister packs.

In use, a blister pack, having in this example ten blisters in an arrangement of five X two, is located on the pack holding means 10, and the frame 16 located over the blister pack in order to retain it firmly against the top plate 14.

Preferably, the pack holding means 10 is in its horizontal position as shown in Figure 2, so as to make it easier for the user to locate the blister pack on the pack holding means 10, both visually and physically. The pack holding means 10 can then be rotated through 90°C by rotating the arm 8, so that the pack holding means 10 is wholly or substantially in the same plane as the cutting means 4 and punching means 6.

The pack holding means 10 is then transferred into a operating position by the arm 8 between the opposing cutting means 4 and punching means 6 as shown in Figure 1.

Turning to Figures 3a-3d, Figures 3a-3b show movement of cutting means 4 towards to blister pack 30. The cutting means 4 comprises a plate 32 having a series of studs 34 thereon, the distal ends of the studs 34 having serrated edges in order to effect weakening and/or complete cutting through the lidding material of the blister pack 30 as shown in Figure 3b.

Figure 3c shows retraction of the cutting means 4.

Figure 3d shows impact of the punching control means 6 on the pack holding means 10. The punching means 6 need only be a ram, arm or piston means able to pressurise the base plate 20 as shown in Figure 3d. Impacting the base of the bottom plate 20 forces it towards the top plate 14, such that the pins 24 travel through the pockets of the blister pack 30 and mechanically push out the contents from the blisters and allow them to fall away from the blister pack 30. This arrangement provides an even force of ejection across all the blisters.

The ejected contents of the blister pack will fall by gravity beneath the operating position, and can be collected by a convenient receptacle for use or repackaging.

In this time, the pack holding means 10 has been relatively stationary, other than the bottom plate 20 and pins 24. The pack holding means 10 is now moved from the operating position between the cutting means 4 and the punching means 6 by operation of the ram 8.

The restraining frame 16 is then manually, or preferably automatically, moved away from the top plate 14, such that the deblistered blister pack can fall away from or be taken away from the pack holding means 10 to allow a new blister pack to be loaded. Where the pack holding means 10 is in a vertical position and the restraining frame 16 is

moved away, the deblistered blister pack may inherently fall away from the pack holding means.

Figure 5 shows a second arrangement for a lidding material cutting means 40, similar to the cutting means 4 in Figure 1, and a moveable transfer plate 42. Like the transfer plate 42 in Figure 1, the transfer plate 42 has a pack holding means 44 therewith. The transfer plate 42 is moveable between an out of alignment position shown by arrow A, and an operating position shown by arrow B. The plate 42 is moveable between such positions on an arcuate guide means such as two rails 46.

In use, the pack holding means 44 is in its horizontal position shown by arrow A, for location of a blister pack, again having a 5x2 arrangement, to be loaded therein. The pack holding means 44 and transfer plate 42 then travels along the guide rails 46 to the operating position shown by arrow B.

The movement of the transfer plate 42 and pack holding means 44 between the positions shown in Figure 5 could be associated with a hand-lever or the like, which lever also moves between a horizontal position and the operating position next to the cutting means 40.

In the operating position, the pack holding means 44 and blister pack are aligned with studs 48 on the cutting means 40. In a similar operation to that shown in Figures 3a-d, the cutting means 40 moves

towards the blister pack to weaken and/or completely cut through the lidding material of the blister pack. The cutting means 40 is then retracted.

Thereafter, a punching means (not shown) which could be similar to that shown in Figures 1-3d, or even conjoined with the transfer plate 42, impacts the base of the pack holding means 44 in a manner similar to that shown in Figure 3d, such that pins (not shown) in the pack holding means 44 travel through the pockets of the blister pack and mechanically push out the contents from the blisters, allowing the contents to fall away and be collected. The transfer plate 42 and pack holding means 44 are then moved back out of alignment of the operating position, shown by arrow A, from which the emptied blister pack can be removed, and another blister pack loaded.

The present invention provides a simple apparatus having few moving parts for deblistering of a blister pack. Only the pack holding means requires significant movement into and out of alignment with the cutting means and punching means, each of which requires little movement in themselves to provide their effect.